



Sampling Issues: Chlorinated HC's vs Petroleum HC's



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- First “white paper” or deliverable from the workgroup:
 - OUST recently finalized: “Petroleum Hydrocarbons And Chlorinated Hydrocarbons Differ In Their Potential For Vapor Intrusion”; which is now available on EPA's website at www.epa.gov/oust/cat/pvi/pvicvi.pdf.
- OUST is also developing a compendium of information about petroleum vapor intrusion (PVI) which will be available in the next several weeks via OUST's home page at www.epa.gov/oust. If you want more information about the petroleum hydrocarbons and chlorinated hydrocarbons document, the PVI compendium, or PVI in general, please contact Hal White of my staff at white.hal@epa.gov or 703-603-7177.
 - Carolyn Hoskinson, Director
 - EPA's Office of Underground Storage Tanks

Petroleum Hydrocarbons And Chlorinated Hydrocarbons Differ In Their Potential For Vapor Intrusion

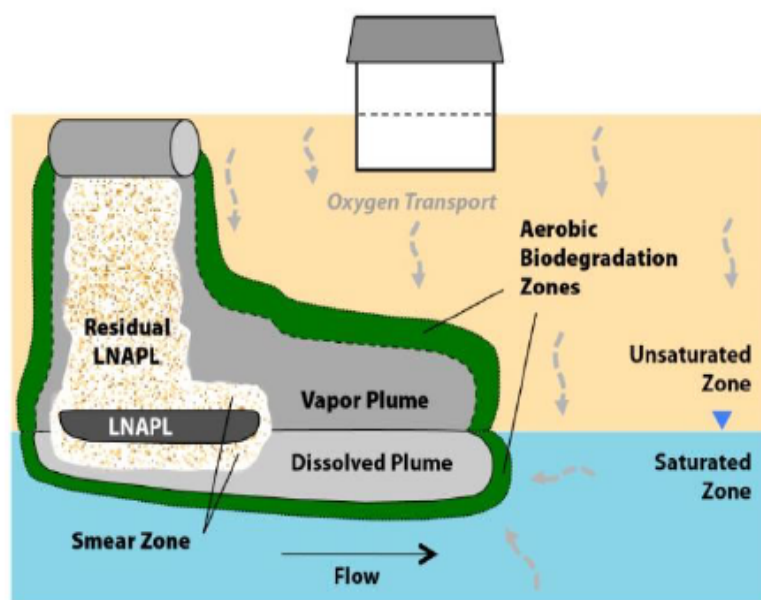


Figure 1. Typical petroleum hydrocarbon transport conceptual scenario

Aerobic biodegradation of PHCs along the perimeter of the vapor and dissolved plumes limits subsurface contaminant spreading. Effective oxygen transport (dashed arrows) maintains aerobic conditions in the biodegradation zone. Petroleum LNAPL (light nonaqueous phase liquid) collects at the groundwater surface (the water table, blue triangle).

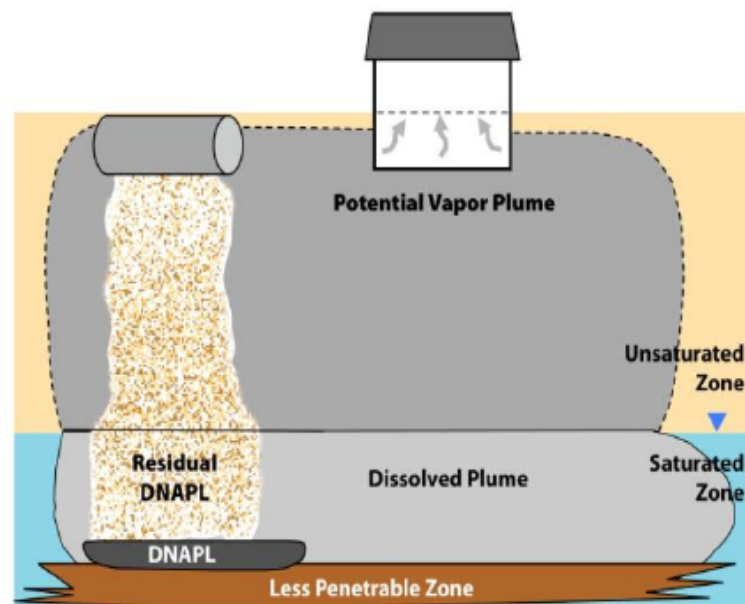
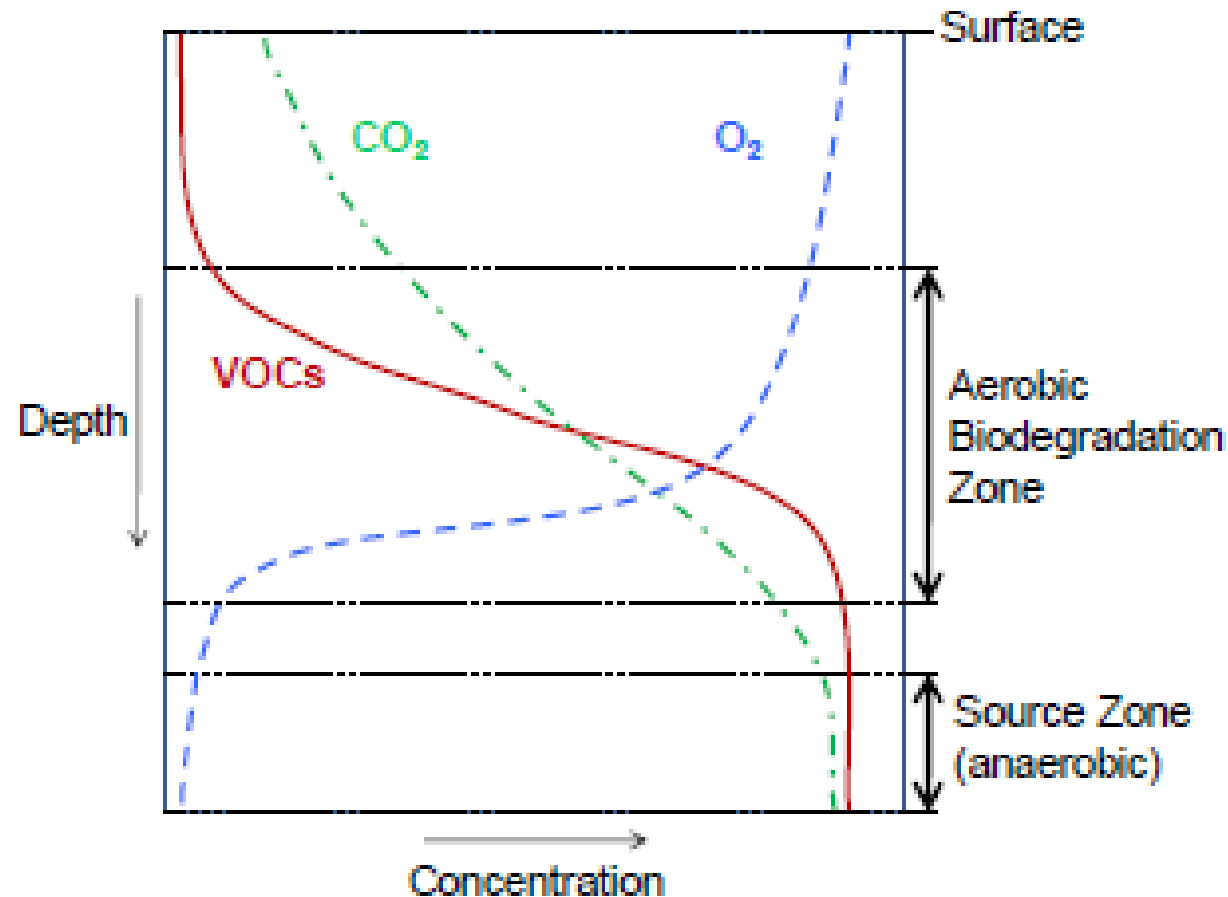


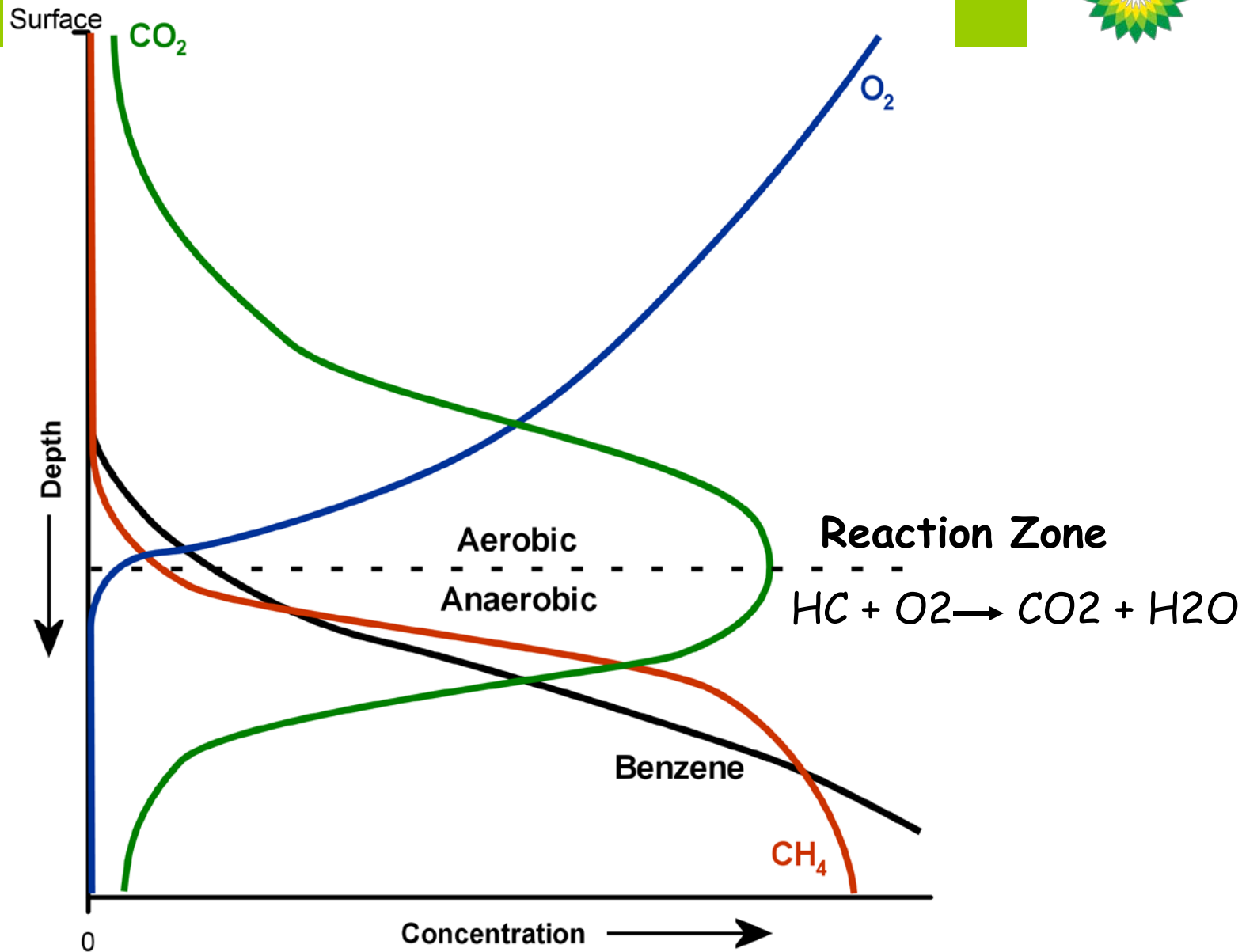
Figure 2. Typical chlorinated solvent transport conceptual scenario

Biodegradation of CHCs is anaerobic and usually slower than PHC biodegradation, so that the vapor and dissolved plumes often migrate farther than PHC plumes. CHC DNAPL (dense nonaqueous-phase liquid), if present, can sink below the water table, collecting in this case on a less penetrable layer.

Typical vertical concentration profile in the unsaturated zone for VOCs, CO₂, and O₂



Clean Soil Model for HC Vapors



Clean Soils vs Dirty Soils



CLEAN SOILS

- Have oxygen concentrations above 3%
- Have no residual petroleum hydrocarbons
- PID values will be below 100 ppm
- Usually have low methane and carbon dioxide values
- Non-detect or very low petroleum hydrocarbon vapors

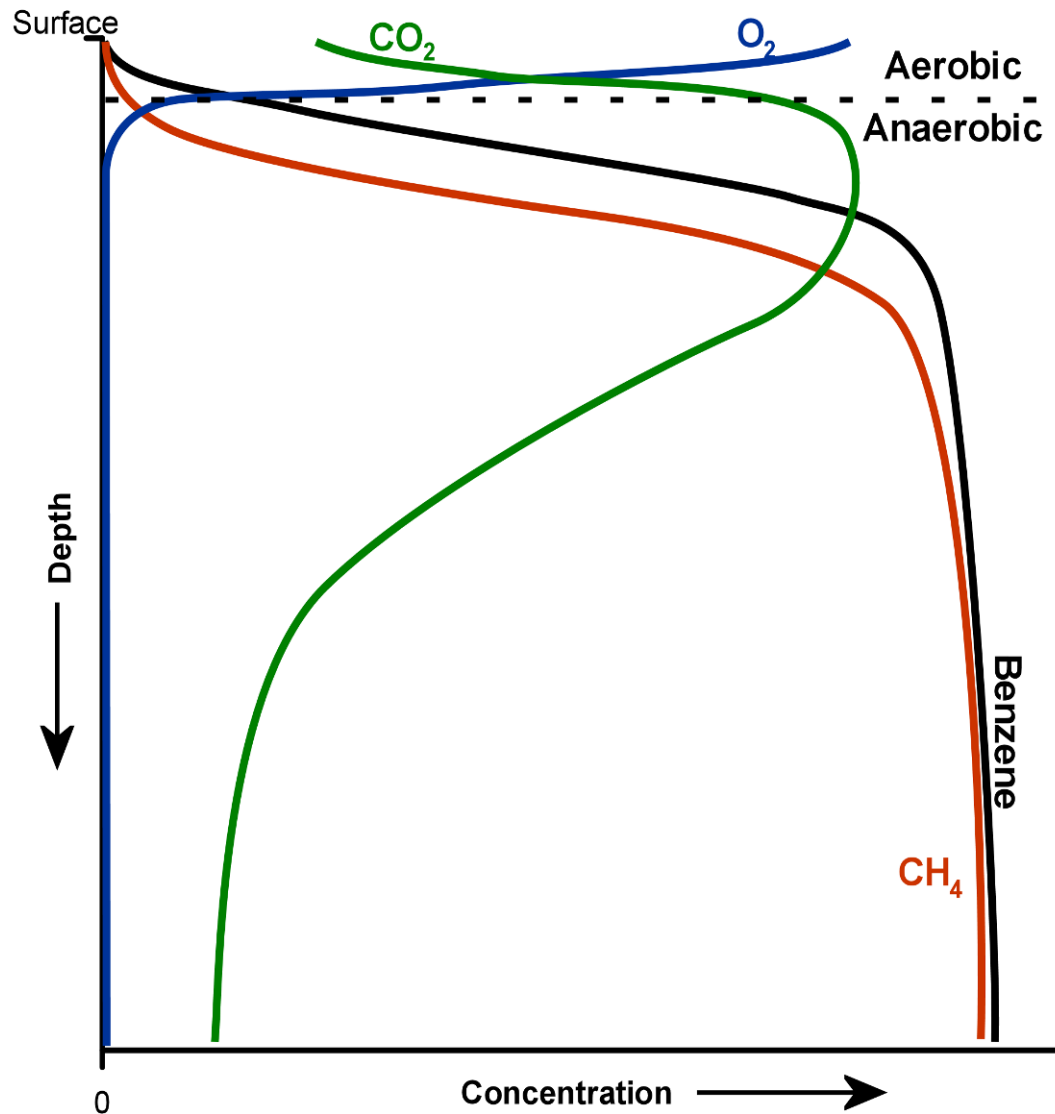


DIRTY SOILS

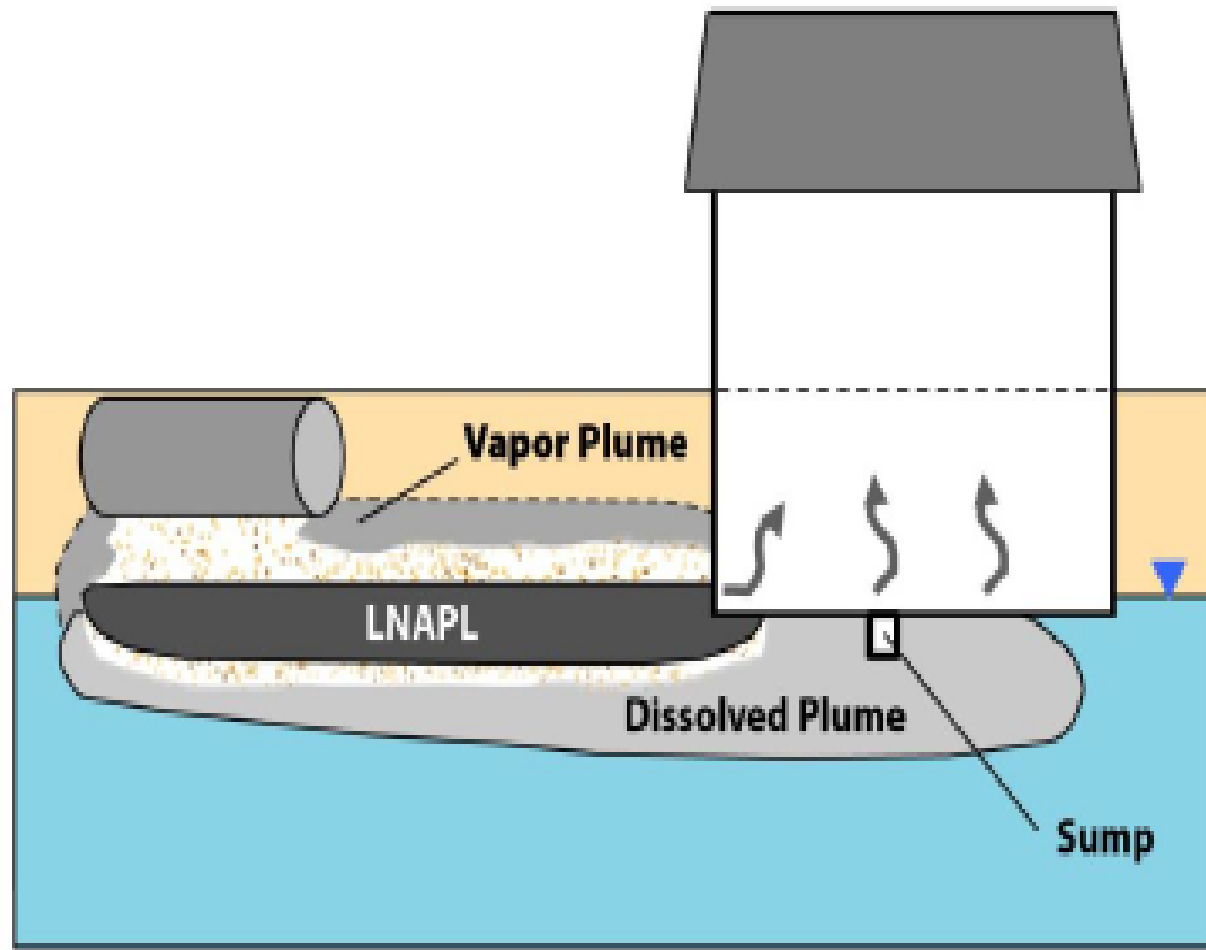
Have low oxygen concentrations (at or near 0%)
Can have residual petroleum hydrocarbons
PID reading at or above 100 ppm
Usually have high methane and carbon dioxide values
Elevated petroleum hydrocarbon vapors



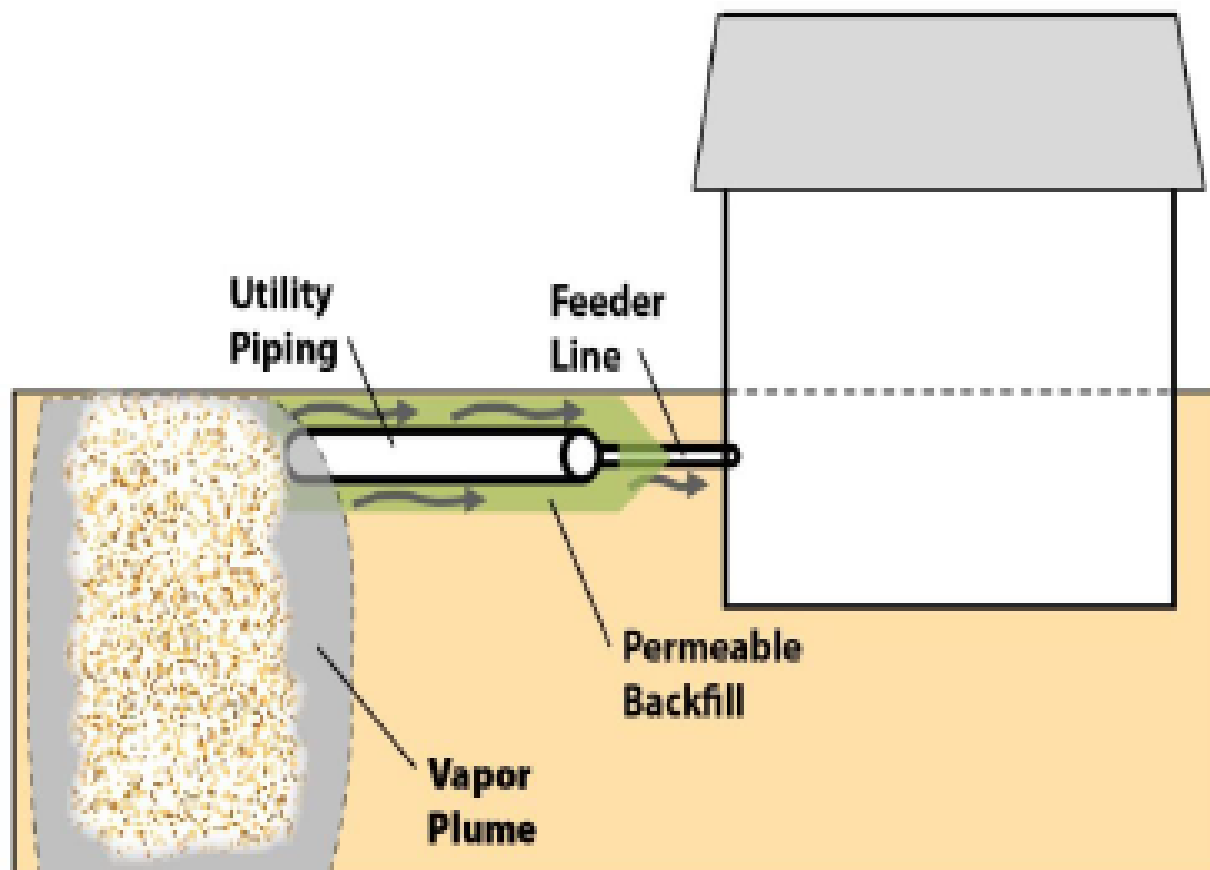
Dirty Soil Model for HC Vapors



Vapor intrusion from direct building contact



Preferential transport through a utility trench



“Top Ten” List of VI Sampling Issues Encountered



- Soil Gas Probe Installation Issues:
 - Using wrong tubing type
 - Pinching off of tubes due to incorrect surface completion
 - Not collecting an equipment blank
- Consultant Field Sampling Issues:
 - Not opening Summa canisters or Tedlar bags
 - No experience with swagelok connectors
 - Applying too much liquid tracer



“Top Ten” List of VI Sampling Issues Encountered



- Workplan Issues:

- Workplans submitted for VI work not needed
- Too many samples recommended by consultant than what is needed
- Not collecting samples in upper part of vadose zone (e.g., 5' bgs) to demonstrate bioattenuation
- Analyzing compounds that were never used at the site.
- Not analyzing for fixed air gases



Top Ten” List of VI Sampling Issues Encountered



- Probe installation: ground disturbance issues mean no direct push methods can be used
- Avoid air knife
- Vertical profiles needed to evaluate VI pathway
- Purging: Usually first purge is highest after purging sampling apparatus. Greater the purge volume the greater the area sampled



Top Ten” List of VI Sampling Issues Encountered



- Smaller samples are better; including Summa canisters
- Flow rate can easily be monitored using hand held syringe
- Tedlar bags phased out soon; maximum holding time about 3 days for benzene and 2 days for TEX
- Proposing indoor air sampling before evaluating if the VI pathway is complete

